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The placing material is remarkable in that the support (1) receives a shaft (2) in a freely sliding manner with the capacity for blocking in position, at the end of which shaft a curved profiled guide (4) is fixed for corresponding to the profile of the tibia, which guide (4) forms a horizontal support plane and which shaft (2) is designed to be temporarily fixed on a part of the tibia.

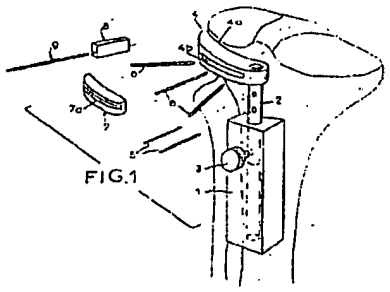


FIG.1

Material for Placing in Particular a Tibial and/or Femoral Element of a Bi-Compartmental Prosthesis for the Articulation of the Knee

The invention relates in particular to a material or instrumentation for placing implants of a bi-compartmental prosthesis of the knee comprising femoral implants of the type whose profile in section corresponds to the average radius of curvature of the condyle and comprises tibial implants of the type formed with a pad or support plate suitable for cooperating with the resected mass of the tibial spines.

The materials used at the present are not entirely satisfactory.

As concerns the placing of the tibial implant, the use, obviously after having taken the various necessary x-rays and measures, of an apparatus called a tibial sighting piece comprising a support for being positioned on the crest of the general axis of the tibia shaft is known. The sighting piece itself, that occupies a significant volume, is mounted in this support in such a manner that significant problems of placing such an apparatus appear on an open knee.

Another very significant problem resides in the fact that the sighting piece, intended for receiving a saw blade or other blade, must be maintained in position manually, generally by an assistant of the practitioner. It can be seen that this manner of operation is not very rational and is very uncertain, risking damaging the quality and the result of the placing of the implant.

In order to remedy these disadvantages and solve the problems posed, according to the invention the support of the tibial sighting piece receives, in a freely sliding manner with the ability to be blocked in position, a shaft at the end of which a profiled curved guide is fixed for corresponding to the profile of the tibia, which guide forms a horizontal support plane and which shaft is designed in such a manner as to be temporarily fixed on a part of the tibia.

Moreover, another problem that the invention proposes to solve is to be able to respect to the maximum the initially determined tibial section plane, which is not permitted with the currently used means that oblige the work to be performed in an approximate manner and by successive steps.

This problem is solved in accordance with the invention in that the tibial guide has a slot for the passage of members of the pin type suitable for cooperating with the tibia for indicating and preserving the initially calculated tibial section plane, which pin is capable of receiving, after removal of the entirety of the tibial guide, a reversible section template.

There is also a desire to palliate any errors made at the level of the section plane in order to take into account differences that can exist between the frontal part and the posterior part. Such a problem is solved in accordance with the invention taking into account the fact that the section template is engaged on the pins by means of a slot arranged in an asymmetric manner in the thickness of this template while corresponding on one side to the slot of the tibial template.

It is also apparent that no account is taken in the ancillary placing material of the rotational components of the knee, that is, of the frontal section of the mass of the spiral spines.

In order to solve this problem in accordance with the invention the section template receives a vertical support stud in a perpendicular plane that cooperates with a suitably oriented pin in order to indicate the angle of curvature of the mass of tibial spines as a function of the rotation of the knee, which stud constitutes a guide and support means for the section member.

As concerns the placing of the femoral implant for taking into account the rotational stresses at the moment of the flexing of the knee, it is necessary that the positioning of the implant is perfect on the three spatial planes. The frontal plane of curvature must therefore consider the load.

In order to solve this problem and achieve the sought-after goal, according to the invention a posterior femoral section guide is used composed of a shaft that receives on its end a curved support pad whose radius of curvature corresponds to the condyle pad that is remarkable in that the shaft is positioned relative to the support pad in such a manner as to be arranged in correspondence with and in axial alignment with the anchoring stud that the tibial implant normally presents before being placed, which shaft is axially pierced in order to permit the engagement of a bit.

The invention is disclosed below in more detail with the aid of the attached drawings in which:

- Figure 1 is a perspective view showing the principal elements of placing material for the tibial implants.

- Figures 2, 3, 4, 5 and 6 are views of a purely schematic nature showing the principal operative phases for the preparation of the tibial compartment.

- Figures 7 and 8 are sectional views respectively of the tibial guide and of the template of the tibial section,

- Figure 9 is a perspective view of the femoral section guide.

- Figure 10 is a longitudinal section of the femoral guide section put in place on the condyle in the position of the flexion of the knee, in combination with the plane of tibial cut.

- Figure 11 is a plane view of a schematic nature showing the positioning of the femoral guide.

In order to make the subject matter of the invention more concrete it will now be described in a non-limiting manner with reference made to the exemplary embodiments of the figures of the drawings.

The sighting piece of tibial section comprises a support (1) whose transversal section has a V profile over the totality of its height in order to be applied, positioned and centered in combination with the general axis of the tibial shaft. This type of support is known.

According to the invention the support (1) receives a shaft (2) in a freely sliding manner that is mounted with the ability to block in vertical position at different heights. For example, the blocking can be carried out by

means of a screw (3) engaged in an oblong slot (2a) of the shaft and screwed in the support (1). This shaft (2) receives a profiled guide (4) at its end, especially in a removable manner, which guide forms a horizontal support plane. The guide (4) has an internal radius of curvature (4a) corresponding very considerably to the internal or external profile of the tibia. Therefore, there are two guides (4) for corresponding to the right profile and to the left profile according to the case (figure 2).

The upper part of the shaft (2) that appears projecting over the support (1) comprises holes for the engagement of fixation pins (5) in order to ensure the maintaining and position of the guide unit (4) and of the shaft (2). Under these conditions the support (1) can be removed (figure 3).

Furthermore, the tibial guide (4) comprises a longitudinal slot (4b) in a horizontal plane through which slot pins (6) can be engaged. These pins (6), in particular three in number, have the essential function of maintaining and indicating the initially calculated plane of tibial section in a classic manner after the various radiographies and measures have been carried out. In fact, after the placing of these pins (6) (figure 4) it is possible to remove the tibial guide unit (4) and shaft (2) and the level of the sectional plane to be made is still indicated by these pins.

These pins (6) act as support for a section template (7) with a reduced dimension (figure 5). To this end the template (7) has a slot (7a) in a horizontal plane which slot can cooperate with the totality of the pins.

In a significant manner the slot (7a) is arranged in an asymmetric manner relative to the thickness of the template (7) in order to make it reversible and able to be used along two different horizontal planes.

This slot (7a) is arranged at a distance (a) from one of its edges and at a distance (b) relative to its other edge with distance (a) being greater than distance (b). Moreover, the distance (a) corresponds very exactly to the distance (a') separating the slot (4b) from the edge of the tibial guide (4). It thus appears that after the positioning of the section template (7) on the pins (6) in a manner identical to the tibial guide (4), (according to the distance (a)), if the section made is not sufficient, it is sufficient to turn the template over in order to consequently change the level of the tibial section.

As concerns the problem of the estimation of the rotation of the knee, that is, of the frontal section of the mass of the spiral spines, along a certain angular orientation, a vertical support stud (8) is used. This stud (8) is arranged so as to cooperate with a positioning pin (9) for indicating the section angle ( ) [sic] of the mass of the spines. The angular positioning of this pan (9) was illustrated and described in the patent application 87.06043 of which the applicant of the present application is also the holder. Succinctly speaking, it is recalled that this pin cooperates with the internal edge of the external condyle (E) at 90 degrees of flexion of the knee in order to indicate the angular section to be performed on the corresponding side of the mass of the tibial spines as a function of the rotation of the knee.

It is sufficient under these conditions to engage the stud (8) on the pin (9) in vertical support on the section template (7) in a perpendicular plane (figure 6). This stud (8) acts as a counter-support for the guiding of the sectioning member.

At the level of the femur the material used comprises a femoral section guide designated in its entirety by (10).

The section guide comprises a shaft (10a) integral with a curved support pad (10b) whose radius of curvature is determined in such a manner as to correspond very considerably to the profile of the condyles.

In a significant manner the shaft (10a) is arranged relative to the curved support pad (10b) in such a manner as to be positioned in correspondence and in axial alignment with the anchoring pad that the tibial implant normally presents before being placed.

This shaft 10a) of which the length is at least 10 cm and very significant permits a very exact positioning, under the optimum bio-mechanical conditions, of the curved support pad (10b), in particular in the middle of the corresponding tibial plate. The shaft (10a) is hollow in order to allow the passage of a bit (11) for masking the implantation of the anchoring stud.

Furthermore, it is necessary to take account of the rotational stresses at the moment of the flexing of the knee in such a manner that the positioning of the future implant must be perfect in the three spatial planes while respecting the curvature of the condyle, the asymmetry of the condyle

and while considering that the frontal plane of curvature should take the dynamic and/or static load into account (figure 11). As a consequence, the shaft permits the manner in which it is necessary to plane to be well visualized so as to immediately have a good orientation for the implant and indicates how the condyle should be ground in order to have a good fit on the condyle as a function of the load axis to be given to it.

During flexion, it is also necessary to position the implant rigorously perpendicular to the plane of tibial section. To this end the lower end of the curved support pad (10) has a squared support edge (10c) in order verify that the posterior section plane of the condyle is perfectly parallel to the tibial section plane in order to avoid any overhang and supplementary load (figure 9).

The curved support pad (10b) has two slots (10d) and (10e) on each side of the shaft (10a) and along its median axis in order to mark, by means of a lancet, for example, the determined angular positioning. It is then sufficient to place the definitive implant in correspondence with these marking lines with the anchoring stud of this implant placed facing the emplacement of the hole determined by the hollow shaft (10a).

It should be noted that in order to ensure the anti-rotational positioning of the implant (10), it is provided that a pin (12) is fixed in the upper part of the support pad (10b).

**Claims**

- 1 - Material for placing a tibial and femoral element of a bi-compartmental prosthesis for the articulation of the knee, characterized in that it comprises a support (1) capable of being positioned in combination with the general axis of the tibia shaft, which support (1) receives a shaft (2) with free sliding and the capacity of blocking in position, at the end of which shaft a curved profiled guide (4) is fixed for corresponding to the profile of the tibia, which guide (4) forms a horizontal support plane, and which shaft is designed to be temporarily fixed on a part of the tibia.

- 2 - The material according to Claim 1, characterized in that the tibial guide (4) comprises a slot (4b) for the passage of members like pins (6) suitable for cooperating with the tibia for indicating and preserving the initially calculated tibial section plane, which pins (6) are capable of receiving a reversible section template (7) after the removal of the tibial guide unit.

- 3 - The material according to Claim 2, characterized in that the section template (7) is engaged on the pins (6) by means of a slot (7a) arranged in an asymmetric manner in the thickness of this template while corresponding on one side to the slot of the tibial template (4).

- 4 - The material according to Claim 3, characterized in that the section template (4) receives a vertical support stud (8) in a perpendicular plane that cooperates with a suitably oriented pin (9) in order to indicate the

angle of curvature of the mass of the tibial spines as a function of the rotation of the knee, which stud (8) constitutes a guide and support means for the section member.

- 5 - The material according to Claim 1, characterized in that it comprises a posterior femoral section guide (10) composed of a shaft (10a) that receives on its end a curved support pad (10b) whose radius of curvature corresponds to the condyle pad, which shaft (10a) is positioned relative to the support pad (10b) in such a manner as to be arranged in correspondence with and in axial alignment with the anchoring stud that the tibial implant normally presents before being placed, which shaft (10a) is axially pierced in order to permit the engagement of a bit.

- 6 - The material according to Claim 5, characterized in that the lower end of the curved support pad (10) has a squared support edge (10c) in order verify that the posterior section plane of the condyle is parallel to the tibial section plane.

- 7 – The material according to any one of Claims 5 and 6, characterized in that the curved support pad (10b) ) comprises means (10d-10e) on each side of the shaft (10a) and along its median axis suitable for indicating the determined angular positioning.

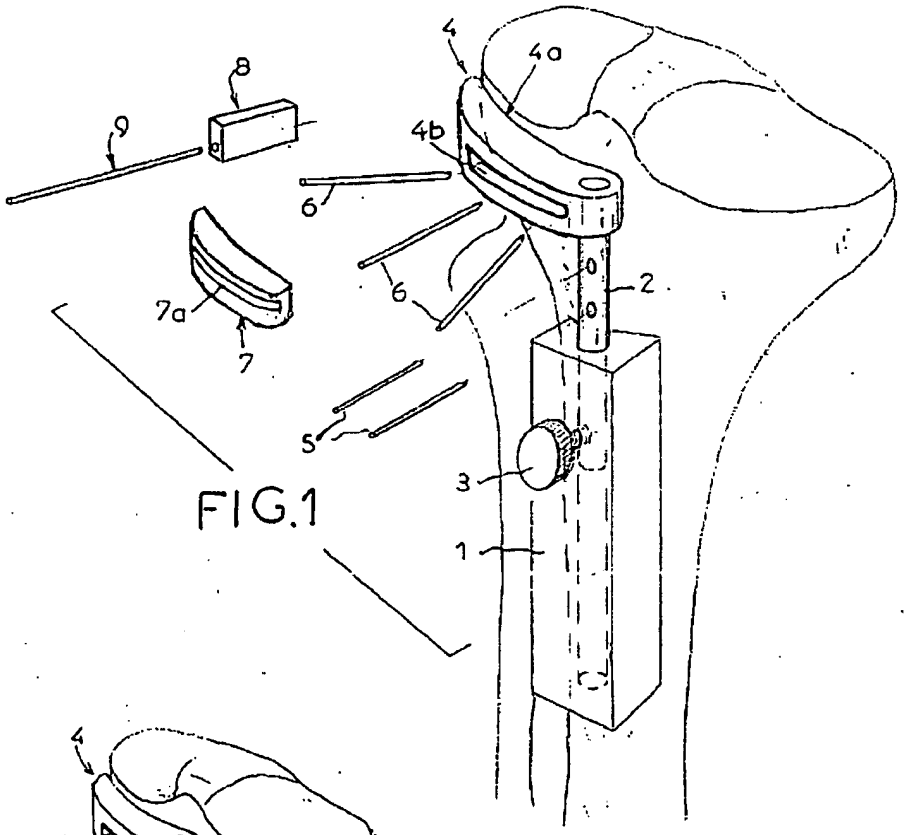



FIG.1

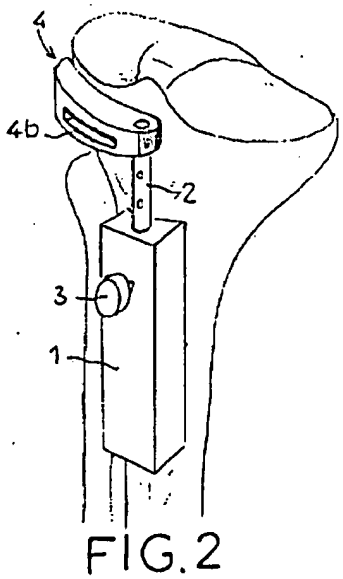



FIG.2

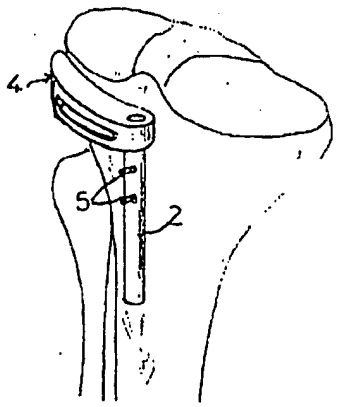



FIG.3

FIG.4

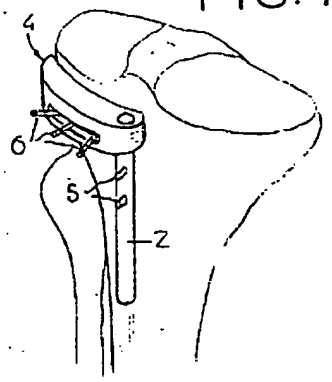
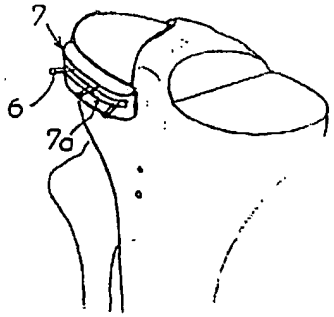



FIG.5



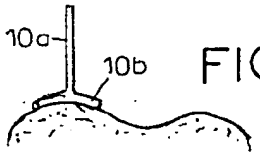




FIG.11

FIG.6

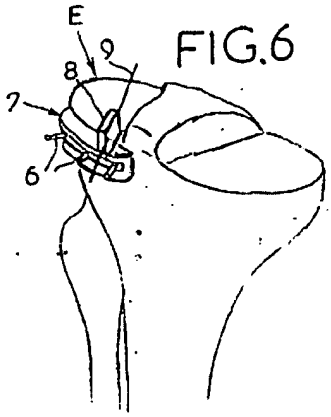



FIG.7

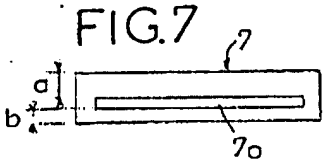



FIG.8

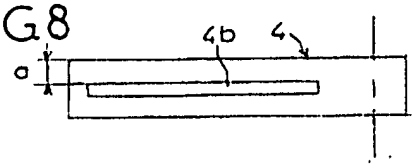



FIG.9

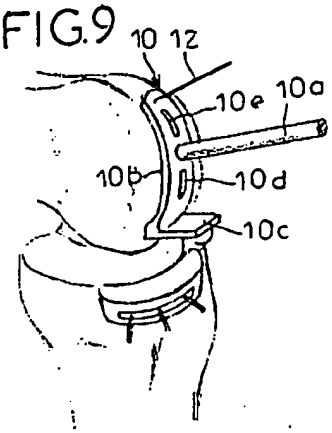



FIG.10